

of cloud according to Howard's nomenclature. His classification by quadrants shows that the same law holds good for all directions as well as for all kinds of clouds, viz, for all altitudes. Combining the four quadrants, his figures show that the lower scud is inclined outward to the wind by  $14.5^\circ$ , the cirro-stratus current is inclined  $22.8^\circ$ , and the current of the true cirri is inclined outward  $29.6^\circ$ . Having, from his wind observations, found that the average or resultant direction of the surface wind at Makerstoun is from the point west  $21^\circ$  south, it follows that, in general, the resultant scud is from west  $7^\circ$  south, the cirro-stratus from the west  $2^\circ$  north, and the cirrus proper from west  $9^\circ$  north. Broun includes cumulus with scud.

The law deduced by Broun for Makerstoun, i. e., that the upper currents are deflected to the right of the lower, has a general application to the whole Northern Hemisphere.

### SEASONAL FORECASTS IN INDIA AND AMERICA.

During the past fourteen years the meteorological office at Calcutta has regularly published in May or June a memorandum giving all the accessible data relative to recent snowfall, rainfall, pressure, temperature, and wind that seemed in any way to bear upon the possibility of forecasting the probable character of the approaching southwest monsoon winds and rains. Such seasonal forecasts can undoubtedly be utilized by many classes of citizens, and the extent to which they are so used must depend largely upon the accuracy with which the season can be forecast.

The memorandum and monsoon forecast for 1898 was published on June 3 of this year by Mr. John Eliot, Meteorological Reporter to the Government of India.

The following is a summary of the chief features of the meteorology of India during the past six months, which are most likely to influence the advance of the monsoon currents and the distribution of the monsoon rainfall:

1. The snowfall of the past winter has undoubtedly been much less than usual over the whole of the western Himalayas and probably also in Afghanistan. It was probably in local excess in Chitral and perhaps in Baluchistan, due chiefly in the latter area to heavy precipitation in December and March. There was a heavy and somewhat abnormal fall in the second week of May over the whole of the western Himalayas (as was also the case in 1883, 1884, and 1888).

2. The pressure conditions in India during the past five months were such as accompany higher temperature in northern India and less snowfall than usual in the western Himalayas, and probably also the eastern Himalayas. The chief features, which have been remarkably persistent, are (a) general deficiency of pressure, (b) local deficiency in northern India and Burma, most marked in Bengal and Burma, and (c) local excess in western India, greatest in Sind, Kathiawar, and the Konkan.

3. The temperature conditions during the past five months are such as usually accompany a more open and drier winter than usual (with scanty snow) in the Himalayan area. Temperature was largely in excess in April and in moderate excess in May. The excess in these months was, on the whole, most pronounced in northwestern India and the north Deccan.

4. The air has been throughout nearly the whole season much drier than usual and skies remarkably free from cloud.

5. The air movement was more vigorous than usual in March and April, due to the intensified thermal conditions of the period in the interior of India.

6. Hence, the snowfall in the Himalayan area has been of such a character as not to impress any conditions upon the pressure distribution, temperature, and air movement in northern and central India unfavorable to the early or full extension of the monsoon currents in their progress northward from the equator.

It may be noted that some of the abnormal features of the meteorology of India during the past seven months have been related to abnormal conditions prevailing in Persia and southeastern Europe. Anticyclonic conditions obtained to a most unusual degree in southern Europe from November onward, and, as a consequence, cool, dry, northwest winds prevailed in Persia with remarkable persistence from November to February. This abnormal air movement extended across Baluchistan and the north of the Arabian Sea into northwestern India, and has undoubtedly contributed to the unusual dryness of the air and freedom from cold-weather storms of the period in northern and central India.

After discussing the special features of the weather and monsoons since 1879, Mr. Eliot makes a detailed forecast for the southwest monsoon and rains of 1898, as follows:

The southwest monsoon rains will probably commence not later than the end of the first week of June on the coast of Bombay and the third week of June on the coast of Bengal. As to the quantity of rainfall, the general conclusion is that the rainfall may be deficient to a slight or moderate extent, depending chiefly upon the strength of the monsoon in Sind, Cutch, the north and west Punjab, and west Rajputana; that it will very probably be at least normal in amount in central India and the northern half of the Peninsula, except, perhaps, Berar, Khandesh, and the west Deccan, and may be in moderate excess in the eastern half of the northwestern provinces, Bihar, the central provinces, and the eastern states of central India. It will probably be normal or in excess in Burma, Assam, and perhaps in east and north Bengal, and may be in slight defect in west Bengal.

In nearly all parts of the world the rainfall goes hand in hand with the distribution of pressure and wind, and, in fact, follows after these. It would not be surprising, therefore, if we should eventually be able to do for portions of the United States as well as Blanford and Eliot have done for India.

### EARTHQUAKES IN NEW BRUNSWICK.

Mr. Samuel W. Kain has published in the bulletin of the Natural History Society of New Brunswick a list of all the earthquakes on record in that Province, together with such details of each as seem worthy of preservation. The following list of dates is taken from his work:

The times given by him are those of St. John local time, which may be reduced to seventy-fifth meridian time by subtracting  $35' 44''$ .

1663, February 5, 5:30 p. m. to 8 p. m.  
1755, November, on several dates.  
1764, September 30, about noon.  
1817, May 22, 3:31 a. m.  
1824, July 9.  
1855, February 8, 6:30 a. m.  
1860, October 17, 6:25 a. m.  
1869, October 22, 5:48 a. m.  
1870, March 17, 6 to 8 a. m.  
1870, October 20, 11:40 a. m.  
1882, December 31, 9:56 p. m.  
1884, January 26.  
1885, June 10, 10 a. m.  
1896, March 22, 7:56 p. m.  
1896, May 15, 11 p. m.  
1897, January 26, a. m.  
1897, January 28, 9 p. m.  
1897, February 14, 9 p. m.  
1897, September 25, 1:30 p. m.  
1897, October 12, 10:35 p. m.  
1898, January 11, 2 a. m.

Concerning each of these Mr. Kain gives such other details as are accessible to him, and will, of course, be pleased to hear from those who can add to the list. He notes the great frequency of earthquakes at Grand Manan, and that shocks are of frequent occurrence in the Bay of Fundy, where they are generally spoken of as the reports of cannon. In regard to this point, Dr. George F. Matthew said:

This part of the Bay of Fundy is remarkable for its great depth and precipitous shores. Off Brier Island the bottom descends to a depth of 100 fathoms in a distance of three miles from the outermost ledge; it is almost equally abrupt on the Grand Manan slope; the trough between is deeper than the bottom of the Gulf of Maine outside adjoining. This is the only part of the Bay of Fundy where there have been heavy outflows of trap of Triassic age on both sides of the bay, and the abyss between may be complementary to these ejections of lava. The weakness of the earth's crust here in Triassic times, as shown by the volcanic eruptions of that age, may not even yet be altogether removed; but the greater tendency to earthquake movements in this district may be the dying throes of the old Triassic disturbances.

### RECENT EARTHQUAKES.

Prof. E. W. Morley, at Cleveland, Ohio, and Prof. C. F. Marvin, at Washington, D. C., report no disturbance on their seismoscopes during the month of June. The following ad-